

Problem C

Nile

Time limit: 5 seconds

Cairo, Egypt

Oh no—ACM has gotten lost on the Nile River! Help them figure out how likely they are to get to each city.

The Nile River flows south to north and has a single entrance¹. Along the way, it passes through some cities. At each city, ACM has some chance of making it to the shore, or continuing to some city immediately downstream. Each city has exactly one city immediately upstream of it.

For each city, what is the probability that ACM makes it to the shore in that city?

Input

The first line contains the integer N ($1 \leq N \leq 10^5$), the number of cities. City #1 represents the entrance to the Nile.

The k^{th} ($1 \leq k \leq N - 1$) line of the next $N - 1$ lines contains two space-separated values j_{k+1}, p_{k+1} ($1 \leq j_{k+1} \leq k$ and $0 < p_{k+1} \leq 1$) where j_{k+1} is an integer and p_{k+1} has at most 6 places after the decimal. This represents the probability of going from city j_{k+1} to city $k + 1$, given that we are currently at j_{k+1} .

It is guaranteed that $\sum_{j_k=i}^{2 \leq k \leq N} p_k \leq 1$ for all i , where the sum is over all nodes with parent i .

Output

Output N lines, where the k^{th} line ($1 \leq k \leq N$) represents the probability of ending up at city k .

For all probabilities, your answer will be accepted if the absolute or relative error is at most 10^{-6} . That is, if the correct answer is y and your answer is x , your answer will be accepted if $\min(|x - y|, \frac{|x - y|}{y}) \leq 10^{-6}$.

Sample Input 1

```
5
1 0.559965
2 0.558041
3 0.673907
4 0.943873
```

Sample Output 1

```
0.44003499999999995
0.247481571435
0.10189865867104655
0.011819491379837926
0.19876527851411557
```

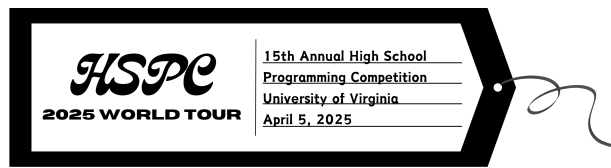
Sample Input 2

```
8
1 0.844215
1 0.098567
3 0.877103
4 0.413058
5 0.30143
5 0.171657
7 0.437507
```

Sample Output 2

```
0.05721799999999995
0.844215
0.012113588598999997
0.05074313819452575
0.01881620718604297
0.010764147652627534
0.0034480361724610357
0.002681882195342716
```

¹At least, as far as the ACM is aware.



Sample Input 3

```
12
1 0.022149
2 0.36004
1 0.193895
4 0.314879
5 0.186376
6 0.857186
1 0.004507
8 0.367827
9 0.506048
1 0.29961
11 0.181227
```

Sample Output 3

```
0.479838999999999996
0.01417447404
0.00797452596
0.132841536295
0.04967456335351693
0.0016250662747967042
0.009753834076686375
0.002849203711
0.0008188717925441279
0.0008389244964558721
0.24531257853
0.054297421469999996
```